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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/811,973

03/30/2004

Toshiya Nozawa

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EXAMINER

SANDVIK, BENJAMIN P

ART UNIT

PAPER NUMBER

2826

DATE MAILED: 08/11/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

10/811,973

Applicant(s)

NOZAWA ET AL.

Examiner

Ben P. Sandvik

Art Unit

2826

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 10 April 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-6, 9-16 and 19-21 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-6, 9-16 and 19-21 is/are rejected.
- 7) ☒ Claim(s) 1 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## **DETAILED ACTION**

### ***Claim Objections***

Claim 1 is objected to because of the following informalities: the phrase "glass scaling member" appears to have a typographical error. Appropriate correction is required.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1, 2, 10-13, and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ochi in view of Takeno et al (U.S. Patent #5532434).

With respect to **claim 1**, Ochi teaches first and second electrodes having layers containing copper as main components (Fig. 4, 3A and 3B); a semiconductor element arranged between said first and second electrodes and electrically connected to said first and second electrodes (Fig. 4, 2); and a glass sealing member which seals said first electrode, said semiconductor element, and said second electrode (Fig. 4, 1); wherein, in the first and second electrodes, ratios of the layers containing copper as main components are not less than 20 wt% (Fig. 2, 12); said first and second electrodes have copper oxide layers formed on the outer peripheries of said layers containing copper as main

components (Fig. 2, 13 and Col 1 Ln 33-34), the copper oxide layers contacting with said glass sealing member, but does not teach that the thickness of the copper oxide layers are 1.5 micrometers or less. Takeno teaches a copper wire that has a copper oxide layer of 0.1 micrometers (Col 6 Ln 18-19). It would have been obvious to one of ordinary skill in the art at the time the invention was made to make the oxide of Ocha less than 1.5 micrometers as taught by Takeno in order to use the oxide to absorb laser light in a laser process.

With respect to **claim 2**, Ochi teaches that said first and second electrodes are constituted by Dumet wires (Col 1 Ln 26).

With respect to **claim 10**, Ochi teaches first and second electrodes wherein the ratios said layers containing copper as main components fall within the range of 20 to 25 wt% (Col 1 Ln 26).

With respect to **claim 11**, Ochi teaches first and second electrodes wherein the ratios said layers containing copper as main components fall within the range of 21 to 24 wt% (Col 1 Ln 26).

With respect to **claim 12**, Ochi teaches that said first and second electrodes have core portions (Fig. 2, 11) and said layers containing copper as main components, said layers being formed on the outer peripheries of said core portions (Fig. 2, 13).

With respect to **claim 13**, Ochi teaches that said core portions of said first and second electrodes comprise a nickel-containing alloy (Col 1 Ln 32).

With respect to **claim 16**, Ochi teaches that said core portions of said first and second electrodes are comprised of an alloy containing iron and nickel as main components (Col 1 Ln 32).

Claims 3, 9, 14, and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ochi, in view of Robinson et al (U.S. Patent #4042951).

With respect to **claim 3**, Ochi teaches all of the limitations of claim 1, but does not teach that said semiconductor element is a diode. Robinson teaches a semiconductor device that is a diode (Col 1 Ln 53-56). It would have been obvious to one of ordinary skill in the art at the time the invention was made to provide the device of Ochi with a diode as taught by Robinson in order to adapt the device to diode functions.

With respect to **claim 9**, Ochi teaches that the thickness of said layers containing copper as main components have a diameter of 0.5 mm (Col 3 Ln 51) but does not teach that the semiconductor element has a bump electrode; wherein the thickness of said layers containing copper as main components are larger than said thickness of said bump electrode. Robinson teaches a semiconductor element having a bump electrode (Fig. 1, 15 and Col 2 Ln 46, the bump is 1-4 mils thick), the thickness of copper containing layers being larger than the thickness of the bump electrode (Fig. 2, 31 and 32). It would have been obvious to one of ordinary skill in the art at the time the invention was made to make the device of Ochi with a semiconductor element having a bump electrode

in order to improve the reliability of the connection to the Dumet electrode, and to make the thickness of the copper containing layers larger than the thickness of the bump electrode in order to maintain a small size of the package.

With respect to **claim 14**, Ochi teaches all of the limitations of claim 12, but does not teach that the nickel-containing alloy has a nickel content of 45 wt% or less. Robinson teaches a core portion comprised of a nickel-containing alloy having a nickel content of 45 wt% or less (Col 2 Ln 23-24). It would have been obvious to one of ordinary skill in the art at the time the invention was made to produce the core portion of Ochi with a nickel content of 45 wt% or less as taught by Robinson in order to control the resistance of the electrode.

With respect to **claim 15**, Ochi teaches all of the limitations of claim 12, but does not teach that the nickel-containing alloy has a nickel content of 41-43 wt% or less. Robinson teaches a core portion comprised of a nickel-containing alloy having a nickel content of 41-43 wt% or less (Col 2 Ln 23-24). It would have been obvious to one of ordinary skill in the art at the time the invention was made to produce the core portion of Ochi with a nickel content of 41-43 wt% or less as taught by Robinson in order to control the resistance of the electrode.

Claims 5 and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ochi and Robinson, in view of Davis et al (U.S. Patent #3723835).

With respect to **claims 5 and 21**, Ochi does not teach that the semiconductor element has a metal electrode, wherein a sealing temperature of

said glass sealing member is a temperature at which silicification of said metal electrode of the semiconductor element is not enhanced. Robinson teaches a semiconductor element with a metal electrode (Fig. 1, 15); and a sealing temperature of the glass sealing member (Col 3 Ln 17-20) is a temperature at which silicification of said metal electrode is not enhanced. It would have been obvious to one of ordinary skill in the art at the time the invention was made to provide the device of Ochi with a semiconductor element having a metal electrode in order to make a reliable connection to the Dumet electrode, and to seal the glass member at a temperature at which silicification of said metal electrode is not enhanced in order to maintain the desired characteristics of the device. Davis teaches a glass-sealing member which is softened and sealed at a temperature less than 630° C (Col 3 Ln 1-5). It would have been obvious to one of ordinary skill in the art at the time the invention was made to seal the glass of Ochi and Robinson at a temperature of less than 630° C as taught by Davis in order prevent degradation of the diode.

Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ochi, in view of Davis.

With respect to **claim 6**, Ochi does not teach a glass material (potassium oxide, Col 3 Ln 40) that has a glass softening point of 560° C or less. Davis teaches a glass-sealing member which is softened and sealed at a temperature less than 630° C (Col 3 Ln 1-5). It would have been obvious to one of ordinary

skill in the art at the time the invention was made to seal the glass of Ochi and Robinson at a temperature of less than 630° C as taught by Davis in order prevent degradation of the diode.

Claims 4, 19, and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ochi, in view of Einthoven (U.S. Patent #4742377).

With respect to **claims 4, 19, and 20**, Ochi teaches all of the limitations of claim 1, but does not teach that said semiconductor element comprises by a Schottky barrier diode having: a semiconductor substrate; an epitaxial layer formed on the semiconductor substrate; and a metal electrode formed on the epitaxial layer. Einthoven teaches a semiconductor element comprising a Schottky barrier diode (abstract) having: a semiconductor substrate (Fig. 4, 11); an epitaxial layer formed on the semiconductor substrate (Fig. 4, 5); and a metal electrode formed on the epitaxial layer (Fig. 4, 13, 15, 17) having a tungsten film (Col 3 Ln 4). It would have been obvious to one of ordinary skill in the art at the time the invention was made to provide the device of Ochi with a semiconductor device comprising a Schottky barrier diode as taught by Einthoven in order to use the device as a rectifier.

### ***Response to Arguments***

Applicant's arguments with respect to claims 1 and 9 have been considered but are moot in view of the new ground(s) of rejection.



Applicant's arguments with respect to the rejection(s) of claim(s) 5, 6, and 21 have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of Davis.

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ben P. Sandvik whose telephone number is (571) 272-8446. The examiner can normally be reached on Mon-Fri.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nathan Flynn can be reached on (571) 272-1915. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

  
**EVAN PERT**  
**PRIMARY EXAMINER**